Important Bibliography Supporting Functional, Integrative Resistance Exercises

For further information on functional, resistance, integrated exercises, consult:
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Reed Humphrey, Researcher Specialist for Reebok University, responds:

If you search the therapeutic exercise texts and look at squat exercises, the issue of squat depth and knee over toe relationships are not discussed except in terms of alignment. My response usually is: "That is interesting. I am not aware of any science that supports your contention. This is an exercise that has functional value, so until I have some data that suggests I shouldn't be doing it, I'll continue". That said, as in any exercise, if the movement is causing pain or discomfort, I would strongly encourage the exerciser to avoid the movement and ascertain the nature of the pain.

Annette Lang, Reebok University Master Trainer and international personal training presenter, responds to common questions about squatting and lunging, including single-leg squats. Whereas traditional fitness used to emphasize the highly conservative stance that the knees remain over ankles, Annette says:

1-Many people initiate the squat by bending the knees, without the corresponding movement of letting the butt go back behind them. It makes sense that this puts too much strain on the knees, because the entire chain is not performing as it should. With proper form, the knee-over toes issue becomes mute.

2-When a squat is done correctly (with enough mobility and stability throughout the entire body) then the knee really doesn't go too far in front of the foot. The amount that it does seems logical as far as dorsiflexion range of motion norms.

3-Many people (unfortunately many group instructors and participants) have literally frozen their capacity to do dorsiflexion in the saggittal plane, either because of muscle imbalances and/or because they have relearned the patterns because of this fear! When you don't dorsiflex as you should in the squat, then it makes sense that the knees take more stress since the movements at the foot and ankle, tibia/fibular movements, and femur/hips don't work the way they are supposed to.

Finally, check out the info from NASM (NASM.org) as they address this a bit. Also, Gary Gray is a pysical therapist who is terrific at talking about this stuff. Go to his website functionaldesign.com and check out some of his articles.
I hope this helps a bit.

Douglas Brooks responds to the single leg squat as a functional exercise:

It's "functional" simply because you're working a closed chain movement, which demands somewhat of an integrated response... linking motion and stabilization at the joints. To tie in function to this, it is linked to classic closed chain exercise (CCE) definitions.

Regarding the knee past the toe... if you make it deep, that does create a shear force, meaning you've moved the exercise from being functional (functional more likely creates force vectors through the joint and now it's across the joint, which is shear). But, the real

issue here is specificity and amount of load being used. Using body weight is more defensible, rather than 135 pounds on your back, and.... you have to ask why would "real" or average people need to squat so low as to do a hyperflexed or knees beyond the toes position? We use the single leg squat position sometimes on the BOSU sometimes with ski conditioning and snow boarders because they experience these positions in their sports... but, we don't load the same position with heavy weights in the weight room.

Dr. Peter Francis, Reebok University Research Specialist, shares the following:

Reebok University and San Diego State found that the one-legged squat is a very effective exercise for gluteus maximus, the hamstrings and gluteus medius. In addition, it is known that it is very good for vastus medius. The latter muscle is very important for stabilizing the knee joint (It improves patella tracking and helps to prevent/rectify the muscle imbalance that causes chondromalacia patellae).

The issue of the knee getting ahead of the toe is reasonable for lunges. In the latter exercise the knee is behaving very dynamically when it is flexing under load. By comparison, the one-legged squat is done very slowly, and is much less dynamic. In addition, we encourge people to perform the one-legged squat at a slow cadence, and limit the amount of knee flexion initially, and to progress very slowly if they squat a little deeper. We also issued the warning that anyone who has had a knee injury should be especially cautious, and to do something alse if they feel undue discomfort. The exercise is being done widely.

Best wishes
Pete Francis